

We claim:

- 1 1. A method for treating a molecular sieve catalyst comprising:
2 contacting a feed comprising oxygenates with a total reaction volume of a
3 molecular sieve catalyst under conditions effective to produce a stream
4 comprising C₂-C₃ olefins, wherein said total reaction volume comprises
5 desirable carbonaceous deposits which render said catalyst more
6 selective to C₂-C₃ olefins than in the absence of said desirable
7 carbonaceous deposits; and,
8 wherein, upon accumulation of undesirable carbonaceous deposits effective to
9 interfere with catalyst activity, said desirable carbonaceous deposits are
10 maintained on said molecular sieve catalyst by a process comprising:
11 separating said total reaction volume of molecular sieve catalyst into a
12 portion and a remainder;
13 treating said portion with a regeneration medium under conditions
14 effective to remove said undesirable carbonaceous deposits,
15 forming a regenerated portion comprising in the range of from
16 about 0 wt% to a regenerated amount of carbonaceous deposits;
17 and,
18 mixing said regenerated portion with said remainder, wherein said
19 regenerated amount of carbonaceous deposits comprises an
20 amount sufficient, upon said mixing, to produce a regenerated
21 total reaction volume comprising said desirable carbonaceous

22 deposits.

1 2. The method of claim 1 wherein said regenerated amount of
2 carbonaceous deposits comprises an amount of about 0.5 wt% or less of said
3 regenerated portion.

1 3. A method for treating a molecular sieve catalyst comprising:
2 contacting a feed comprising oxygenates with a total reaction volume of a
3 molecular sieve catalyst under conditions effective to produce a stream
4 comprising C₂-C₃ olefins, wherein said total reaction volume comprises
5 desirable carbonaceous deposits which render said catalyst more
6 selective to C₂-C₃ olefins than in the absence of said desirable
7 carbonaceous deposits; and,
8 wherein, upon accumulation of greater than about 1.5 wt% carbonaceous
9 deposits, said desirable carbonaceous deposits are maintained on said
10 molecular sieve catalyst by a process comprising:
11 separating said total reaction volume of molecular sieve catalyst into a
12 portion and a remainder;
13 treating said portion with a regeneration medium under conditions
14 effective from a regenerated portion comprising in the range of
15 from about 0 wt% to about 0.5 wt% carbonaceous deposits;
16 and,

17 mixing said regenerated portion with said remainder, wherein said
18 regenerated amount of carbonaceous deposits comprises an
19 amount sufficient, upon said mixing, to produce a regenerated
20 total reaction volume comprising said desirable carbonaceous
21 deposits.

1 4. A method for treating a molecular sieve catalyst comprising:
2 contacting a feed comprising oxygenates with a total reaction volume of a
3 molecular sieve catalyst under conditions effective to produce a stream
4 comprising C₂-C₃ olefins, wherein said total reaction volume comprises
5 desirable carbonaceous deposits which render said catalyst more
6 selective to C₂-C₃ olefins than in the absence of said desirable
7 carbonaceous deposits; and,
8 wherein, upon accumulation of greater than about 1.5 wt% carbonaceous
9 deposits, said desirable carbonaceous deposits are maintained on said
10 molecular sieve catalyst by a process comprising:
11 separating said total reaction volume of molecular sieve catalyst into a
12 portion and a remainder;
13 treating said portion with a regeneration medium under conditions
14 effective to form a regenerated portion comprising in the range
15 of from about 0 wt% to a regenerated amount of carbonaceous
16 deposits; and,

17 mixing said regenerated portion with said remainder, wherein said
18 regenerated amount of carbonaceous deposits comprises an
19 amount sufficient, upon said mixing, to produce a regenerated
20 total reaction volume comprising said desirable carbonaceous
21 deposits.

1 5. The method of claim 1 wherein said desirable carbonaceous deposits
2 comprise an amount in the range of from about 2 wt% to about 30 wt% of said total
3 reaction volume of molecular sieve catalyst.

1 6. The method of claim 2 wherein said desirable carbonaceous deposits
2 comprise an amount in the range of from about 2 wt% to about 30 wt% of said total
3 reaction volume of molecular sieve catalyst.

1 7. The method of claim 3 wherein said desirable carbonaceous deposits
2 comprise an amount in the range of from about 2 wt% to about 30 wt% of said total
3 reaction volume of molecular sieve catalyst.

1 8. A method for treating a molecular sieve catalyst comprising:
2 contacting a feed comprising oxygenates with a total reaction volume of a
3 molecular sieve catalyst under conditions effective to produce a stream
4 comprising C₂-C₃ olefins, wherein said total reaction volume comprises

desirable carbonaceous deposits in the range of from about 2 wt% to
about 30 wt%; and,
wherein, upon accumulation of greater than about 1.5 wt% carbonaceous
deposits, said desirable carbonaceous deposits are maintained on said
molecular sieve catalyst by a process comprising:
separating said total reaction volume of molecular sieve catalyst into a
portion and a remainder;
treating said portion with a regeneration medium under conditions
effective form a regenerated portion comprising in the range of
from about 0 wt% to about 0.5 wt% carbonaceous deposits;
and,
mixing said regenerated portion with said remainder to produce a
regenerated total reaction volume comprising said desirable
carbonaceous deposits in the range of from about 2 wt% to
about 30 wt%.

9. A method for treating a molecular sieve catalyst comprising:
contacting a feed comprising oxygenates with a total reaction volume of a
molecular sieve catalyst under conditions effective to produce a stream
comprising light olefins, wherein said total reaction volume comprises
desirable carbonaceous deposits which render said catalyst more
selective to light olefins than in the absence of said desirable

7 carb naceous deposits, and wherein said molecular sieve catalyst is
8 selected from the group consisting of:
9 zeolites having a structural type selected from the group consisting of
10 AEI, AFT, APC, ATN, ATT, ATV, AWW, BIK, CAS, CHA,
11 CHI, DAC, DDR, EDI, ERI, GOO, KFI, LEV, LOV, LTA,
12 MON, PAU, PHI, RHO, ROG, THO, MFI, MEL, MTW, EUO,
13 MTT, HEU, FER, AFO, AEL, TON, and combinations thereof;
14 and,
15 silicoaluminophosphate catalysts (SAPO's) selected from the group
16 consisting of SAPO-34, SAPO-17, SAPO-18, substituted
17 SAPO's comprising MeAPSO's, and combinations thereof; and,
18 wherein, upon accumulation of undesirable carbonaceous deposits effective to
19 interfere with catalyst activity, said desirable carbonaceous deposits are
20 maintained on said molecular sieve catalyst by a process comprising:
21 separating said total reaction volume of molecular sieve catalyst into a
22 portion and a remainder;
23 treating said portion with a regeneration medium under conditions
24 effective to remove said undesirable carbonaceous deposits,
25 forming a regenerated portion comprising in the range of from
26 about 0 wt% to a regenerated amount of carbonaceous deposits;
27 and,
28 mixing said regenerated portion with said remainder, wherein said

29 regenerated amount of carbonaceous deposits comprises an
30 amount sufficient, upon said mixing, to produce a regenerated
31 total reaction volume comprising said desirable carbonaceous
32 deposits.

1 10. The method of claim 2 wherein said molecular sieve catalyst is selected
2 from the group consisting of:
3 zeolites having a structural type selected from the group consisting of AEI,
4 AFT, APC, ATN, ATT, ATV, AWW, BIK, CAS, CHA, CHI, DAC,
5 DDR, EDI, ERI, GOO, KFI, LEV, LOV, LTA, MON, PAU, PHI,
6 RHO, ROG, THO, MFI, MEL, MTW, EUO, MTT, HEU, FER, AFO,
7 AEL, TON, and combinations thereof; and,
8 silicoaluminophosphate catalysts (SAPO's) selected from the group consisting
9 of SAPO-34, SAPO-17, SAPO-18, substituted SAPO's comprising
10 MeAPSO's, and combinations thereof.

1 11. The method of claim 3 wherein said molecular sieve catalyst is selected
2 from the group consisting of:
3 zeolites having a structural type selected from the group consisting of AEI,
4 AFT, APC, ATN, ATT, ATV, AWW, BIK, CAS, CHA, CHI, DAC,
5 DDR, EDI, ERI, GOO, KFI, LEV, LOV, LTA, MON, PAU, PHI,
6 RHO, ROG, THO, MFI, MEL, MTW, EUO, MTT, HEU, FER, AFO,

7 AEL, TON, and combinations thereof; and,
8 silicoaluminophosphate catalysts (SAPO's) selected from the group consisting
9 of SAPO-34, SAPO-17, SAPO-18, substituted SAPO's comprising
10 MeAPSO's, and combinations thereof.

1 12. The method of claim 4 wherein said molecular sieve catalyst is selected
2 from the group consisting of:

3 zeolites having a structural type selected from the group consisting of AEI,
4 AFT, APC, ATN, ATT, ATV, AWW, BIK, CAS, CHA, CHI, DAC,
5 DDR, EDI, ERI, GOO, KFI, LEV, LOV, LTA, MON, PAU, PHI,
6 RHO, ROG, THO, MFI, MEL, MTW, EUO, MTT, HEU, FER, AFO,
7 AEL, TON, and combinations thereof; and,
8 silicoaluminophosphate catalysts (SAPO's) selected from the group consisting
9 of SAPO-34, SAPO-17, SAPO-18, substituted SAPO's comprising
10 MeAPSO's, and combinations thereof.

1 13. The method of claim 1 wherein said molecular sieve catalyst is selected
2 from the group consisting of ZSM-5, ZSM-34, erionite, chabazite, and SAPO-34.

1 14. The method of claim 2 wherein said molecular sieve catalyst is selected
2 from the group consisting of ZSM-5, ZSM-34, erionite, chabazite, and SAPO-34.

1 15. The method of claim 3 wherein said molecular sieve catalyst is selected
2 from the group consisting of ZSM-5, ZSM-34, erionite, chabazite, and SAPO-34.

1 16. The method of claim 4 wherein said molecular sieve catalyst is selected
2 from the group consisting of ZSM-5, ZSM-34, erionite, chabazite, and SAPO-34.

1 17. The method of claim 1 wherein said molecular sieve catalyst is selected
2 from the group consisting of small pore and medium pore molecular sieve catalysts.

1 18. The method of claim 2 wherein said molecular sieve catalyst is selected
2 from the group consisting of small pore and medium pore molecular sieve catalysts.

1 19. The method of claim 3 wherein said molecular sieve catalyst is selected
2 from the group consisting of small pore and medium pore molecular sieve catalysts.

1 20. The method of claim 4 wherein said molecular sieve catalyst is selected
2 from the group consisting of small pore and medium pore molecular sieve catalysts.

1 21. A method for treating a molecular sieve catalyst comprising:
2 contacting a feed comprising oxygenates with a total reaction volume of a
3 molecular sieve catalyst other than ZSM-5 under conditions effective to
4 produce a stream comprising light olefins, wherein said total reaction

5 volume comprises desirable carbonaceous deposits which render said
6 catalyst more selective to light olefins than in the absence of said
7 desirable carbonaceous deposits; and,
8 wherein upon accumulation of undesirable carbonaceous deposits effective to
9 interfere with catalyst activity, said desirable carbonaceous deposits are
10 maintained on said molecular sieve catalyst by a process comprising:
11 separating said total reaction volume of molecular sieve catalyst into a
12 portion and a remainder;
13 treating said portion with a regeneration medium under conditions
14 effective to remove said undesirable carbonaceous deposits,
15 forming a regenerated portion comprising in the range of from
16 about 0 wt% to a regenerated amount of carbonaceous deposits;
17 and,
18 mixing said regenerated portion with said remainder, wherein said
19 regenerated amount of carbonaceous deposits comprises an
20 amount sufficient, upon said mixing, to produce a regenerated
21 total reaction volume comprising said desirable carbonaceous
22 deposits.

1 22. A method for treating a molecular sieve catalyst comprising:
2 contacting a feed comprising oxygenates with a total reaction volume of a
3 molecular sieve catalyst comprising SAPO-34 under conditions

4 effective to produce a stream comprising C₂-C₃ olefins, wherein said
5 total reaction volume comprises desirable carbonaceous deposits which
6 render said catalyst more selective to C₂-C₃ olefins than in the absence
7 of said desirable carbonaceous deposits; and,
8 wherein, upon accumulation of undesirable carbonaceous deposits effective to
9 interfere with catalyst activity, said desirable carbonaceous deposits are
10 maintained on said molecular sieve catalyst by a process comprising:
11 separating said total reaction volume of molecular sieve catalyst into a
12 portion and a remainder;
13 treating said portion with a regeneration medium under conditions
14 effective to remove said undesirable carbonaceous deposits,
15 forming a regenerated portion comprising in the range of from
16 about 0 wt% to a regenerated amount of carbonaceous deposits;
17 and,
18 mixing said regenerated portion with said remainder, wherein said
19 regenerated amount of carbonaceous deposits comprises an
20 amount sufficient, upon said mixing, to produce a regenerated
21 total reaction volume comprising said desirable carbonaceous
22 deposits.

1 23. A method for treating a molecular sieve catalyst comprising:
2 contacting a feed comprising oxygenates with a total reaction volume of a

3 molecular sieve catalyst comprising SAPO-34 under conditions
4 effective to produce a stream comprising C₂-C₃ olefins, wherein said
5 total reaction volume comprises desirable carbonaceous deposits in the
6 range of from about 2 wt% to about 30 wt%; and,
7 wherein, upon accumulating greater than about 1.5 wt% carbonaceous
8 deposits, said desirable carbonaceous deposits are maintained on said
9 molecular sieve catalyst by a process comprising:
10 separating said total reaction volume of molecular sieve catalyst into a
11 portion and a remainder;
12 treating said portion with a regeneration medium under conditions
13 effective form a regenerated portion comprising in the range of
14 from about 0 wt% to about 0.5 wt% carbonaceous deposits;
15 and,
16 mixing said regenerated portion with said remainder to produce a
17 regenerated total reaction volume comprising said desirable
18 carbonaceous deposits in the range of from about 2 wt% to
19 about 30 wt%.

1 24. A method for treating a molecular sieve catalyst comprising:
2 contacting a feed comprising oxygenates with a total reaction volume of a
3 molecular sieve catalyst comprising SAPO-17 under conditions
4 effective to produce a stream comprising C₂-C₃ olefins, wherein said

5 total reaction volume comprises desirable carbonaceous deposits which
6 render said catalyst more selective to C₂-C₃ olefins than in the absence
7 of said desirable carbonaceous deposits; and,
8 wherein, upon accumulating undesirable carbonaceous deposits effective to
9 interfere with catalyst activity, said desirable carbonaceous deposits are
10 maintained on said molecular sieve catalyst by a process comprising:
11 separating said total reaction volume of molecular sieve catalyst into a
12 portion and a remainder;
13 treating said portion with a regeneration medium under conditions
14 effective to remove said undesirable carbonaceous deposits,
15 forming a regenerated portion comprising in the range of from
16 about 0 wt% to a regenerated amount of carbonaceous deposits;
17 and,
18 mixing said regenerated portion with said remainder, wherein said
19 regenerated amount of carbonaceous deposits comprises an
20 amount sufficient, upon said mixing, to produce a regenerated
21 total reaction volume comprising said desirable carbonaceous
22 deposits.

1 25. A method for treating a molecular sieve catalyst comprising:
2 contacting a feed comprising oxygenates with a total reaction volume of a
3 molecular sieve catalyst comprising SAPO-17 under conditions

4 effective to produce a stream comprising C₂-C₃ olefins, wherein said
5 total reaction volume comprises desirable carbonaceous deposits in the
6 range of from about 2 wt% to about 30 wt%; and,
7 wherein, upon accumulation of greater than about 1.5 wt% carbonaceous
8 deposits, said desirable carbonaceous deposits are maintained on said
9 molecular sieve catalyst by a process comprising:
10 separating said total reaction volume of molecular sieve catalyst into a
11 portion and a remainder;
12 treating said portion with a regeneration medium under conditions
13 effective form a regenerated portion comprising in the range of
14 from about 0 wt% to about 0.5 wt% carbonaceous deposits;
15 and,
16 mixing said regenerated portion with said remainder to produce a
17 regenerated total reaction volume comprising said desirable
18 carbonaceous deposits in the range of from about 2 wt% to
19 about 30 wt%.

1 26. A method for treating a molecular sieve catalyst comprising:
2 contacting a feed comprising oxygenates with a total reaction volume of a
3 molecular sieve catalyst comprising SAPO-18 under conditions
4 effective to produce a stream comprising C₂-C₃ olefins, wherein said
5 total reaction volume comprises desirable carbonaceous deposits which

6 render said catalyst more selective to C₂-C₃ olefins than in the absence
7 of said desirable carbonaceous deposits; and,
8 wherein, upon accumulation of undesirable carbonaceous deposits effective to
9 interfere with catalyst activity, said desirable carbonaceous deposits are
10 maintained on said molecular sieve catalyst by a process comprising:
11 separating said total reaction volume of molecular sieve catalyst into a
12 portion and a remainder;
13 treating said portion with a regeneration medium under conditions
14 effective to remove said undesirable carbonaceous deposits,
15 forming a regenerated portion comprising in the range of from
16 about 0 wt% to a regenerated amount of carbonaceous deposits;
17 and,
18 mixing said regenerated portion with said remainder, wherein said
19 regenerated amount of carbonaceous deposits comprises an
20 amount sufficient, upon said mixing, to produce a regenerated
21 total reaction volume comprising said desirable carbonaceous
22 deposits.

1 27. A method for treating a molecular sieve catalyst comprising:
2 contacting a feed comprising oxygenates with a total reaction volume of a
3 molecular sieve catalyst comprising SAPO-18 under conditions
4 effective to produce a stream comprising C₂-C₃ olefins, wherein said

5 total reaction volume comprises desirable carbonaceous deposits in the
6 range of from about 2 wt% to about 30 wt%; and,
7 wherein, upon accumulating greater than about 1.5 wt% carbonaceous
8 deposits, said desirable carbonaceous deposits are maintained on said
9 molecular sieve catalyst by a process comprising:
10 separating said total reaction volume of molecular sieve catalyst into a
11 portion and a remainder;
12 treating said portion with a regeneration medium under conditions
13 effective form a regenerated portion comprising in the range of
14 from about 0 wt% to about 0.5 wt% carbonaceous deposits;
15 and,
16 mixing said regenerated portion with said remainder to produce a
17 regenerated total reaction volume comprising said desirable
18 carbonaceous deposits in the range of from about 2 wt% to
19 about 30 wt%.